JOURNAL OF APPLIED BEHAVIOR ANALYSIS 1997, **30,** 507–531 NUMBER 3 (FALL 1997)

THE LONG-TERM EFFECTS OF FUNCTIONAL COMMUNICATION TRAINING IN HOME SETTINGS

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A four-phase study was conducted in the homes of 4 young children who displayed aberrant behavior. Phases 1 and 2 consisted of a series of descriptive and experimental analyses to identify the environmental antecedents and consequences that controlled aberrant behavior. Phases 3 and 4 evaluated the short- and long-term effects of treatment on aberrant behavior, target mands, and collateral (social and toy play) behaviors. The effects of treatment were monitored for up to 27 months to assess long-term suppression of aberrant behavior. The assessment results successfully identified environmental events that occasioned and maintained aberrant behavior for all children. The short-term treatment resulted in immediate decreases in aberrant behavior for 3 of 4 children. Long-term treatment was successful for all children and was correlated with substantial response generalization. These results are interpreted in relation to functional equivalence, pivotal responding, and response generalization.

DESCRIPTORS: aberrant behavior, functional communication training, long-term treatment

A number of investigations have documented the merits of functional communication training (FCT) as a viable treatment for aberrant behavior (Carr & Durand, 1985; Northup et. al., 1994; Wacker et al., 1990). The results of these studies have led to applications of these treatments in schools (Northup et al., 1994) and homes (Arndorfer, Miltenberger, Woster, Rortvedt, & Gaffaney, 1994). As we begin to apply FCT to less controlled settings, the results of both descriptive (Mace & Lalli, 1991) and experimental (Iwata, Dorsey, Slifer, Bauman, & Richman, 1982/1994) analyses are needed to develop effective treatment. Descriptive analyses help to identify the specific situation variables (e.g., specific types of demands) that are correlated with problem behavior, and experimental analyses identify the functional reason why those specific variables occasion or maintain the behavior. In this study, we provide a comprehensive assessment model that proved to be applicable in home settings and provided the data needed to implement successful, long-term FCT.

A second purpose for conducting long-term investigations is to describe the outcomes achieved with treatment. By carefully describing these outcomes, we hope to understand more fully the operant mechanisms that are responsible for the effects of treatment. For example, Carr (1988) proposed

This investigation was completed as part of the requirements for a PhD degree in school psychology by the first author. This investigation was funded in part by the National Institute of Child Health and Human Development and the Iowa University Affiliated Program. However, the opinions expressed do not necessarily reflect those of the funding agencies. The authors thank the families for their participation. We learned a great deal from them. K. Mark Derby is now at the Department of Special Education, Gonzaga University.

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functional equivalence as one explanation for the success of FCT. The basic premise of functional equivalence is that the alternative mand (a) serves the same function as aberrant behavior and (b) serves as a one-to-one replacement response during treatment. Given the two components listed above, if the mand is the only behavior that results in reinforcement, then the mand should replace aberrant behavior. The results of previous investigations (Carr & Durand, 1985; Wacker et al., 1990) have shown that mands appear to replace aberrant behavior across treatment sessions under both of these conditions (ongoing reinforcement of mands and extinction or mild punishment of aberrant behavior). Evidence supporting the hypothesis that both of these components are responsible for the success of FCT was provided by Fisher et al. (1993), Wacker et al. (1990), and Northup et al. (1994). In these investigations, a period of successful FCT treatment (1 week to 1 year) was followed by probe conditions in which punishment or extinction for aberrant behavior was removed. Removal of extinction or punishment resulted in aberrant behavior quickly reemerging during these probe conditions and was correlated with a decrease in manding (even though manding continued to be reinforced). Thus, previous research has shown that FCT suppresses aberrant behavior under specific conditions. However, when a component of the FCT package is removed (e.g., extinction), aberrant behavior may reemerge. Procedures are needed, therefore, to augment FCT to further decrease the probability that aberrant behavior will reappear during long-term treatment when at least brief periods of extinction are likely to occur.

One approach to reducing problems associated with extinction is to reinforce collateral behaviors that are adaptive and correlated with manding. Studies by Koegel and Frea (1993) and Sprague and Horner (1992) suggested that FCT may result in a number of positive collateral responses that are correlated with manding. For example, Sprague and Horner reported that during FCT training, 1 student displayed an increased occurrence of task-related verbalizations when taught to mand for help during demanding situations (i.e., schoolwork). It makes intuitive sense that these changes in collateral behavior are pleasing to care providers and are, therefore, reinforced. Thus, not only are specific mands reinforced, but a potentially wide array of positive social behaviors may also receive reinforcement; that is, mand training may result in a rather broad range of reinforced behaviors. Long-term maintenance of treatment effects may then occur not solely because of ongoing reinforcement of the mand (Durand & Carr, 1991) but also because a relatively large number of related social behaviors also receive reinforcement.

There were three specific purposes for this study. First, we proposed an assessment model that successfully blended descriptive and experimental analyses (Mace & Lalli, 1991) for use in home settings with young children. A wide array of assessment procedures have been reported in the literature (e.g., Carr & Durand, 1985; Iwata et al., 1982/1994; Mace & Lalli, 1991), and the blending of these procedures for use in home settings appears to be needed. Second, we studied the long-term effects of FCT, a procedure that is based directly on the results of functional assessment and that has been reported to be successful for treating aberrant behavior. Recent studies have shown positive long-term effects of this treatment (Durand & Carr, 1991; Northup et al., 1994). We sought to extend this literature by showing very long-term results (at least 6 months) that involved regularly scheduled probe assessments of the results of treatment. Third, we evaluated, in a preliminary way, one mechanism that may be responsible for

Table 1
Target Behaviors, Mands, and Demographic Characteristics of Participants

Name	Age (years)	Target behaviors	Mand	Intellectual level	Other diagnoses	Medications
Billy	2 to 4½	Self-injury (head banging); destruction (throwing objects); tantrums	"Please" sign	Developmental delay (severe to profound)[a]	Visual impairment; asthma	None
Kelly	3 to 5	Self-injury (hand biting, eye pressing); tantrums	Two-word phrase "want ___"	Moderate to severe mental retardation	Cerebral palsy; epilepsy	Depakane®
Danny	2 to 2½	Destruction (throwing objects); noncompliance	"Finish" sign	Developmental delay (moderate to severe)[a]	Severe language delay	None
Matt	3 to 5	Self-injury (head banging, hand biting); destruction (throwing objects); noncompliance; tantrums	"Finish" sign	Developmental delay (severe to profound)[a]	Visual impairment	None

[a] Because of the level of problem behaviors displayed by Billy, Danny, and Matt, formal intellectual testing was not possible. Thus, intellectual levels provided in parentheses are based on adaptive skills.

the long-term results of treatment. Specifically, we assessed the correlated changes in collateral behavior (e.g., toy play) that occurred concurrently with treatment. Our hypothesis was that covariation between aberrant and manding behavior would occur initially with treatment, but that, over time, increases in collateral responding would serve to suppress aberrant behavior. Thus, over time, we hypothesized that neither the target mand nor aberrant behavior would occur at high rates, because both would be replaced by collateral behaviors that were reinforced by parents.

METHOD

Participants and Setting

Participants were the first 4 children enrolled in a long-term in-home early intervention project (Wacker & Berg, 1992). Initial functional analyses indicated that 2 of the children displayed aberrant behaviors that were maintained by an attention function, 1 child's aberrant behaviors were maintained by an escape function, and 1 child's aberrant behaviors were maintained by both attention and escape functions. The children were between the ages of 2 to 5 years, received early intervention services through their local area education agencies, and engaged in aberrant behavior (e.g., self-injury, aggression, destruction) that interfered with educational and social development. Specific topographies of self-injury included head banging, head hitting, and hand biting, which resulted in tissue damage (e.g., bleeding, severe bruising). The level of aggression and destruction engaged in by these children often resulted in removal from group settings (i.e., classrooms, day care). Demographic data for the participants are provided in Table 1.

All evaluations were completed in the child's home, usually in the family room, and were videotaped using a Panasonic camcorder (Model PV710). All assessment and treatment contingencies were delivered by the child's parent with weekly consultation from

the first author. One to three members of the investigation team were present during each evaluation session. For 1 participant (Matt), evaluation sessions were also conducted in his classroom and in the family's summer home. We conducted functional analyses in the classroom because his parents expressed concern about his behavior during preschool as well as at home. During classroom observations, Matt's teacher delivered assessment contingencies with consultation from members of the project team. During the treatment sessions conducted in the family's summer home, sessions were videotaped without team members present, and team members consulted with Matt's parents by phone.

Measurement

Response Definitions

Four general categories of children's behavior were measured: (a) target behavior, (b) mands, (c) appropriate behavior, and (d) collateral responses. *Target behavior* was defined as aberrant responses that were targeted for intervention. Specific target responses for each child were selected based on parent interviews and preassessment observations and are provided in Table 1. *Mands* were defined as any prompted or unprompted oral word or sign that was taught to the child as part of an FCT treatment package to request a break from a work task, to gain social attention, or to gain tangible items. *Appropriate behavior* was defined as any behavior that the child displayed to complete an assigned activity (e.g., being on task during work activities, independently playing with toys, and sitting quietly when told to wait). *Collateral responses* were defined as behaviors that were not targeted for intervention but were related to ongoing interactions with parents. All social communicative responses emitted by the child were probed throughout the investigation. Collateral responses were divided into two categories: first occurrence and ongoing. First-occurrence responses were defined as social and toy play behaviors that had a discriminable first occurrence during the investigation. The first observed occurrence of a collateral behavior during pretreatment observations (i.e., baseline) and following the initiation of treatment was noted on an event recording form and was described according to its topography. First-occurrence responses were further divided into positive and negative (Matt and Kelly only) responses. Positive first-occurrence responses included saying new words, handing a toy to the parent, and guiding a parent's hands through song motions (e.g., clapping hands for pat-a-cake). Examples of negative first-occurrence responses for Matt included screaming, kicking toys, and swearing. For Kelly, one negative response—perseverative verbalization—occurred throughout assessment, treatment, and follow-up and was defined as repeating the same word two or more times. The first time a response occurred, it was recorded as a first-occurrence response. Additional occurrences of the same response were then scored as an ongoing collateral response. For the purposes of this investigation, ongoing collateral responses were categorized as either toy play or positive social responses. Toy play was defined as any physical manipulation of toys that were not part of a work activity. Positive social responses were defined as any response by the child in which appropriate physical or verbal initiations were directed toward the parent (e.g., physical gestures such as reaching out or accepting a toy from the parent's hand and babbling). Because Kelly's perseverative verbalizations were observed prior to the initiation of treatment, they were recorded and graphed as ongoing negative collateral responses.

Parents' Behavior

Two categories of parents' behavior were recorded to assess treatment integrity: (a) reinforcement and (b) mild punishment. Re-

inforcers and punishers were identified via a functional analysis. Positive reinforcement consisted of the contingent presentation of social attention or tangible items for mands or positive collateral responses. Negative reinforcement consisted of the contingent removal of task demands. For aberrant behaviors that were maintained by positive reinforcement, punishment consisted of timeout, defined as the removal of parent attention and tangible items contingent on the occurrence of aberrant behavior. For aberrant behaviors that were maintained by negative reinforcement, punishment consisted of guided compliance.

Data Collection

All sessions were videotaped. The children's and parents' responses were later recorded by project team members trained in data collection. The children's target behavior, mands, and appropriate and ongoing collateral responses and the parents' responses were recorded using a 6-s partial-interval recording system. First-occurrence collateral responses were recorded using an event recording system. During the experimental analysis, a baseline of each discrete topography of positive social, negative social, and toy play behavior was listed by category. During approximately every third session of treatment, first-occurrence responses were added to each list, resulting in a cumulative listing of first-occurrence responses. Representative examples of first-occurrence positive social and toy play responses obtained during the experimental analysis (i.e., baseline) and the first three treatment sessions for Billy are provided in Table 2.

Interobserver Agreement

Children's behavior. For mands, appropriate, target, and ongoing collateral behavior, agreement checks were conducted on 129 sessions (across experimental analysis, treatment, and follow-up phases), which constituted 91% of all sessions. A second observer independently recorded responses during at least the first 30% of each session. Interobserver agreement was calculated on an interval-by-interval basis (Kazdin, 1982) on the occurrence of behaviors within each interval and was computed by dividing agreements by agreements plus disagreements and multiplying by 100%. Overall occurrence agreement averaged 94% (means: Billy = 94%, Kelly = 93%, Matt = 95%, Danny = 95%) and ranged from 85% to 100% across all sessions.

For first-occurrence collateral responses, a second observer independently recorded responses during 54 of the sessions, which constituted 81% of all sessions recorded for collateral responses. Interobserver agreement was calculated using an exact event-recording method; both observers needed to agree that the same behavior occurred for the first time in the session being observed for an agreement to be recorded. Overall interobserver agreement for first-occurrence behaviors averaged 96% (means: Billy = 95%, Kelly = 98%, Matt = 96%, Danny = 95%) and ranged from 87% to 100% across all sessions.

Parents' behavior. A second observer independently recorded parents' responses during the first 30% of 88 sessions (78% of all sessions). Interobserver agreement was calculated in the same fashion as used for the children's target behaviors. Overall occurrence agreement for parents' behavior averaged 95% (means: Billy's mother = 97%, Kelly's mother = 97%, Matt's mother = 95%, Danny's mother = 94%) and ranged from 80% to 100% across all sessions.

Treatment integrity. The contingent presentation of consequences by parents was evaluated for each condition to assess integrity. Reinforcement integrity for mands was defined as the contingent delivery of an identified reinforcer within 12 s of a trained mand. Reinforcement integrity averaged 84% and ranged from 83% to 89% across parents. Punishment integrity was defined as the contin-

Table 2
First Occurrence of Positive Social and Toy Play Behaviors During Baseline and the First Three Treatment Sessions for Billy

Category	Baseline	Session 1	Session 2	Session 3
Positive social	1. Babble	1.		
	2. Touching Mom	2.		
	3. Reaching out	3.		
	4. yea (verbal)	4.		
		5. Laughing		
		6. Grunting	8. Hugging	
		7. Smiling	9. Mom (verbal)	10. No (verbal)
				11. Oh-ho (verbal)
Toy play	1. Hold toy[a]			
		12. Push[a] down pop-up toy		
	11. Take peg out of peg board			
			21. Turn[a] crank on jack in the box	
		20. Roll car back and forth		28. Turn on[a] record player
			27. Pulling puppet toy off his hand	
				47. Rolling toy cars on table

[a] First occurrence behaviors were added to a cumulative list as they occurred. Because of space limitations, only the first and last toy play behaviors recorded during each session are provided.

gent delivery of a mild punisher within 6 s of a child's aberrant response. Punishment integrity averaged 48% and ranged from 0% to 65% across parents. Low punishment integrity occurred because parents often ignored (placed on extinction) aberrant behavior or waited longer than 6 s. No parent reinforced aberrant behavior.

Although ongoing social behaviors were not directly targeted for intervention, we also recorded when the parent delivered attention within 6 s of a child's ongoing social response. Parents delivered social attention 85% of the time, with a range of 74% to 87% across parents.

DESIGN AND GENERAL PROCEDURE

The investigation was conducted in four phases. During Phase 1 (descriptive assessment), a daily behavor log and a parent interview were conducted. During Phase 2 (experimental analysis), antecedent (Axelrod, 1987; Carr & Durand, 1985) and consequence (Iwata et al., 1982/1994) analyses were conducted to identify the maintaining conditions for aberrant behavior. The antecedent analysis evaluated the effects of high and low levels of parent attention, task preference, and task difficulty on aberrant behavior. The antecedent analysis was conducted within a multielement design. The consequence (functional) analysis evaluated the effect of events that were hypothesized to maintain aberrant behavior (positive or negative reinforcement) and was developed based on the antecedent analysis. For example, if decreased social attention was shown to set the occasion for aberrant behavior in the antecedent analysis, the functional analysis tested the hypothesis that ab-

errant behavior was attention maintained by comparing social attention and one or more control conditions (e.g., free play). The functional analysis was conducted within a multielement design. During Phase 3, an FCT treatment (Carr & Durand, 1985) was matched to the function of aberrant behavior. This analysis was conducted within a multiple baseline across subjects design. Following approximately 6 months of treatment, brief versions of the consequence analysis (Northup et al., 1991) of manding behavior (i.e., contingency reversal conditions) were conducted for each child. These analyses were conducted within a multielement design. During Phase 4, follow-up treatment probes were conducted for a period of up to 20 months. For Billy, Kelly, and Danny, treatment and follow-up were conducted within the condition that was most frequently associated with aberrant behavior (diverted attention or demands). For Matt, whose initial functional analysis suggested both escape and attention functions, both demand and diverted-attention conditions were probed. Treatment was implemented across these two conditions in a staggered fashion, with FCT being implemented initially in the demand condition during Phase 3 and in the diverted-attention condition during Phase 4. Treatment was implemented in the demand condition first because this condition was reported to be the most problematic for Matt's parents during the initial functional analysis.

Descriptive Assessment

Following the child's referral to the project, an initial home visit was made by the first author, and the general procedures were explained to the parent. Each parent was told that a series of assessments would be conducted and videotaped. During this home visit, parents were asked to complete a daily behavior log for 1 week. The parents were also asked to rate activities that were available in the home. Each activity was rated according to high or low levels of child preference, social attention provided by the parent, and task demand. *High preference* was defined as an activity that the child, when given a choice, would participate in most often. *Low preference* was defined as an activity that the child, when given a choice, would not participate in. *High social* was defined as an activity that involved continuous parent interaction. *Low social* was defined as an activity that involved no parent interaction. A *high-demand task* was defined as an activity that the child needed assistance to complete. A *low-demand task* was defined as an activity that the child could complete independently. For the daily behavior log, parents were instructed to indicate the frequency of aberrant behavior within 30-min intervals between 5:00 a.m. and 11:00 p.m. for 1 week (Touchette, MacDonald, & Langer, 1985). After 1 week, the parent interview was conducted. During the interview, parents were asked to identify the presence of environmental events during times associated with high levels of aberrant behavior. The interview focused on the antecedent events that preceded problematic behavior, the specific behaviors that occurred, and the environmental outcomes of the behavior. Given this information, we were able to (a) identify possible times to conduct subsequent antecedent and consequence analyses, (b) identify specific activities to use during subsequent analyses, and (c) operationally define aberrant behaviors (see Appendix for a summary of all assessment results).

Antecedent Analysis

Antecedent analyses consisted of a series of analogue sessions in which the child was observed interacting with his or her mother for approximately 5 min. The presence or absence of social attention, task demands, and preferred or nonpreferred activities was manipulated systematically across sessions

(detailed descriptions of the conditions completed and the results obtained during the antecedent analysis are available from the first author). A brief break (1 min) was provided between each session. All manipulations were implemented by the child's mother with guidance from the first author. The analysis continued until each variable that was hypothesized to set the occasion for aberrant behavior (based on the descriptive assessment) was assessed. Number of sessions per day and number of days varied for each child. An average of seven sessions were completed per day (range, 5 to 10) across an average of 2 days (range, 1 to 4).

Functional Analysis

The functional analyses consisted of a series of 5-min analogue sessions. A brief free-play condition (1 min) was provided between each session. Order of assessment conditions was based on hypotheses that were generated via the antecedent analysis and the child's performance in each of the preceding functional analysis conditions. For example, if the descriptive and antecedent assessments suggested an attention function, we compared the delivery of contingent attention for aberrant behavior to the delivery of continuous noncontingent attention across a series of analogue conditions. All independent-variable manipulations were implemented by the child's parent or teacher (Matt only) with coaching from the first author. Analogue conditions, representing either positive or negative reinforcement situations, were compared to a control condition (i.e., free play) until the contingent delivery of a specific reinforcer was shown to maintain aberrant behavior. Number of sessions completed per day and number of days varied for each child, with an average of five sessions completed per day (range, 5 to 8) across 1 to 3 days.

Specific Functional Analysis Procedures

Control condition. The functional analysis always began with a control (free-play) condition that represented the best possible combination of attention, preference, and demand variables found during the antecedent analysis. This condition was conducted to control for the contingent presentation of positive and negative reinforcers. All aberrant behavior was ignored.

Positive reinforcement conditions. There were two versions of the positive reinforcement condition: social attention and tangible. During the social attention condition, no demands were placed on the child, preferred toys were available, but parental attention was diverted. The parent maintained a proximity of 1.5 to 3 m from the child but ignored him or her unless the child displayed aberrant behavior. When aberrant behavior was displayed, the parent provided social attention for 15 to 20 s or until aberrant behavior stopped. When providing attention, the parent verbally reprimanded the child for engaging in aberrant behavior and physically blocked the behavior.

During the tangible condition, the parent placed a preferred toy (identified during the antecedent analysis) in view, but it was withheld from the child. No demands were placed on the child. The parent maintained a proximity of 1.5 to 3 m to the child but ignored him or her unless aberrant behavior occurred. When aberrant behavior occurred, the parent provided the child with the preferred toy for 15 to 20 s or until the aberrant behavior stopped.

Negative reinforcement (escape) condition. During the escape condition, the parent presented the child with a demanding task that set the occasion for aberrant behavior during the antecedent analysis. The task was presented using a three-step prompt sequence: (a) verbal instruction, (b) modeling of the activity, and (c) hand-over-hand physical

guidance. No praise or positive attention was provided. The demanding task was presented at a continuous rate throughout the condition except when aberrant behavior was displayed. The child received a 15- to 30-s break from the task contingent on the occurrence of aberrant behavior. During the break, the activity was removed, and the parent turned away from the child.

Contingency reversal conditions. During follow-up, functional analysis conditions were conducted using the contingency reversal conditions described by Northup et al. (1991). The reinforcer that maintained target behavior during the functional analysis was provided to the child contingent on manding behavior. Two types of contingency reversals, one each for positive reinforcement and negative reinforcement, were completed.

If positive reinforcement maintained target behavior during the initial functional analysis, the parent delivered social attention or tangible items contingent on the occurrence of manding. During this condition, the parent maintained a proximity of 1.5 to 3 m to the child and delivered social attention or preferred items contingent on the occurrence of manding. When aberrant behavior was displayed, the parent turned away from the child and removed toys until the behavior no longer occurred. Following 5 to 10 s of appropriate behavior, the parent prompted the child to display the designated mand and provided the child with social attention or tangible items for 15 to 30 s. After about 30 s, the child was again prompted to mand.

If target behavior was maintained by negative reinforcement, the parent provided a break from the task contingent on the occurrence of manding. During this condition, the child was presented with a demanding task, and, following 15 to 30 s of appropriate task completion, the parent allowed the child to take a 30-s break if the designated mand was displayed. Following the break, the parent prompted the child to display the mand to stay on break. The child was redirected to the task contingent on the occurrence of inappropriate behavior or the absence of the mand.

Baseline, Functional Communication Training, and Follow-up

Baseline

Baseline sessions were selected from the antecedent analyses based on functional analysis results. That is, baseline sessions were selected post hoc to utilize antecedent conditions that both set the occasion for aberrant behavior and controlled for other environmental events that could influence responding. For children who engaged in aberrant behavior to escape tasks, baseline conditions consisted of sessions that presented demanding tasks. Conversely, for children who engaged in aberrant behavior to gain social attention, baseline conditions consisted of sessions that were associated with low levels of social attention.

Functional Communication Training

When the function of aberrant behavior was identified, parents were trained to implement an FCT treatment package. Training included three components. First, each parent was provided with a written report regarding the assessment results and a description of the treatment contingencies being recommended. Second, a 1-hr training session was conducted by the first author. The training session was videotaped, and the videotape was given to the parent for future reference. Finally, parents were provided with feedback regarding their implementation of the treatment contingencies following each home visit. Throughout the investigation, parents were instructed to complete daily 10- to 30-min training sessions. In addition, parents were encouraged to reinforce their children's mands outside of the training sessions when appropriate. For example, Bil-

ly's and Kelly's parents were instructed to reinforce appropriately requested attention when the parent entered a room. Similarly, Matt's and Danny's parents were instructed to allow their children to briefly escape tasks if an appropriate mand was emitted during a task activity.

During treatment, weekly to monthly home visits were conducted. The frequency of the home visits and the length of the treatment phase depended on family routine and treatment outcomes. If the frequency of aberrant behavior decreased, we gradually faded the follow-up probes to a 3-month and eventually to a 6-month schedule. Otherwise, weekly to monthly home visits were continued throughout the investigation. There were two training conditions, each representing a recommended treatment package: positive reinforcement plus time-out and a combination of negative and positive reinforcement plus guided compliance.

Positive reinforcement plus time-out. This condition was used if aberrant behavior was shown to serve a positive reinforcement function and the child was observed to engage in aberrant behavior when the parent's attention was diverted. During this condition, no demands were placed on the child, and preferred toys were available. During initial treatment, the parent prompted the child verbally (e.g., "If you want Mom, sign please") and physically (if needed) to emit the mand approximately every 30 to 60 s. When the mand was emitted, the parent delivered 30 to 60 s of enthusiastic social attention. If aberrant behavior was displayed, the parent turned away from the child or left the room for 20 to 30 s or until the problematic behavior stopped. If aberrant behavior began to put the child or others in physical danger, the parent was instructed to neutrally block the behavior. When the child stopped engaging in aberrant behavior, the parent prompted the child to emit the alternative mand, and, if it was emitted, the parent resumed interaction with the child.

Combination of negative and positive reinforcement plus guided compliance. We used this condition if aberrant behavior was shown to serve a negative reinforcement function. During this condition, the parent presented the child with a task demand using the three-step prompt sequence. The child received social praise during the task contingent on the occurrence of appropriate behavior. The task was presented for approximately 30 to 60 s, at which time the parent prompted the child to emit a mand with a statement such as, "Do you want a break? If you do, say ___." If needed, the parent physically prompted the child to mand. The child received a break for 15 to 30 s contingent upon emitting the alternative mand. During the break, the task was removed, and the parent provided the child with attention and access to preferred activities. If aberrant behavior was displayed, the child was prompted back to the task, and guided compliance was applied until aberrant behavior stopped. When the child stopped engaging in aberrant behavior, the parent prompted the child to emit the mand; if the mand was emitted, the child was allowed to take a 15- to 30-s break from the task.

Follow-Up

The follow-up phase began when treatment had been in place for approximately 6 months and a contingency reversal analysis had been conducted; for Kelly only, follow-up was initiated after 2 months because the treatment was altered to incorporate interventions in place at school. For all children, a contingency reversal analysis was conducted after approximately 6 months of treatment. Also, additional contingency reversal analyses were conducted to evaluate possible threats to treatment success that were identified based on parent report. For example,

Billy's mother reported that he was beginning to engage in increased aberrant behavior to gain access to toys. Given this information, additional analyses were conducted at 9, 12, and 17 months to determine the role of tangible reinforcement. Similarly, Kelly's mother reported increased levels of aberrant behavior during demanding situations; therefore, an additional analysis was conducted at 12 months to evaluate the role of negative reinforcement. During the follow-up phase, fewer home visits were conducted (i.e., monthly visits for about 6 months and then every 3 to 6 months for the remainder of the investigation).

Diverted-Attention Condition for Matt

In addition to probing the treatment conditions, we also probed situations typically encountered in the home for all children. For example, we observed the children when the parents' attention was diverted and during play times. Given the amount of data collected, the results from these sessions are not included here; thus, for each child there are some gaps in the figures. (The results obtained during these probes are available from the first author.) Matt's initial functional analysis suggested both escape and attention functions; therefore, we have included the results for a second condition: diverted attention. During this condition, the only demand was to play independently, and preferred activities were available. At the beginning of this condition, the parent was told that we wanted to see how Matt would play independently when parent attention was not available. Following this instruction, the investigators engaged the parent in a conversation to divert his or her attention from the child. If the child appropriately solicited the parent's attention with a mand or with any other appropriate social response (e.g., offered the parent a toy), the parent interacted with the child for about 30 s. Following this brief interaction, the investigator diverted the parent's attention.

RESULTS

The Appendix provides a summary of the results obtained during the descriptive, antecedent, pretreatment functional, and posttreatment contingency reversal analyses. In the figures, three sets of data are provided: (a) pretreatment functional analyses of aberrant behavior; (b) baseline, treatment, and follow-up probes of aberrant and manding behavior; and (c) treatment and follow-up probes of collateral behaviors. Pretreatment functional analyses of aberrant behavior are provided for each child in Figure 1. Baseline, treatment, and follow-up probes are provided in separate figures for each child. Results of Matt's treatment are shown in two figures: one for the combination of negative reinforcement and positive reinforcement plus guided compliance and one for the diverted-attention condition.

The daily behavior log indicated that Billy's aberrant behaviors (including self-injury, destruction, and tantrums) occurred most often when he woke up and when his siblings returned home from school. The interview suggested that these times were associated with decreased parent attention. The parent's typical reaction to Billy's aberrant behavior was to pick Billy up and hold him (i.e., increased physical attention). During the antecedent experimental analysis, the highest levels of all topographies of aberrant behavior were occasioned by decreased parent attention, suggesting an attention function. This hypothesis was further evaluated during the functional analysis. Billy's initial functional analysis (Figure 1) compared contingent attention to free-play conditions, and the results indicated that aberrant behavior occurred most often when social attention was provided contingent on aberrant behavior, supporting our attention function

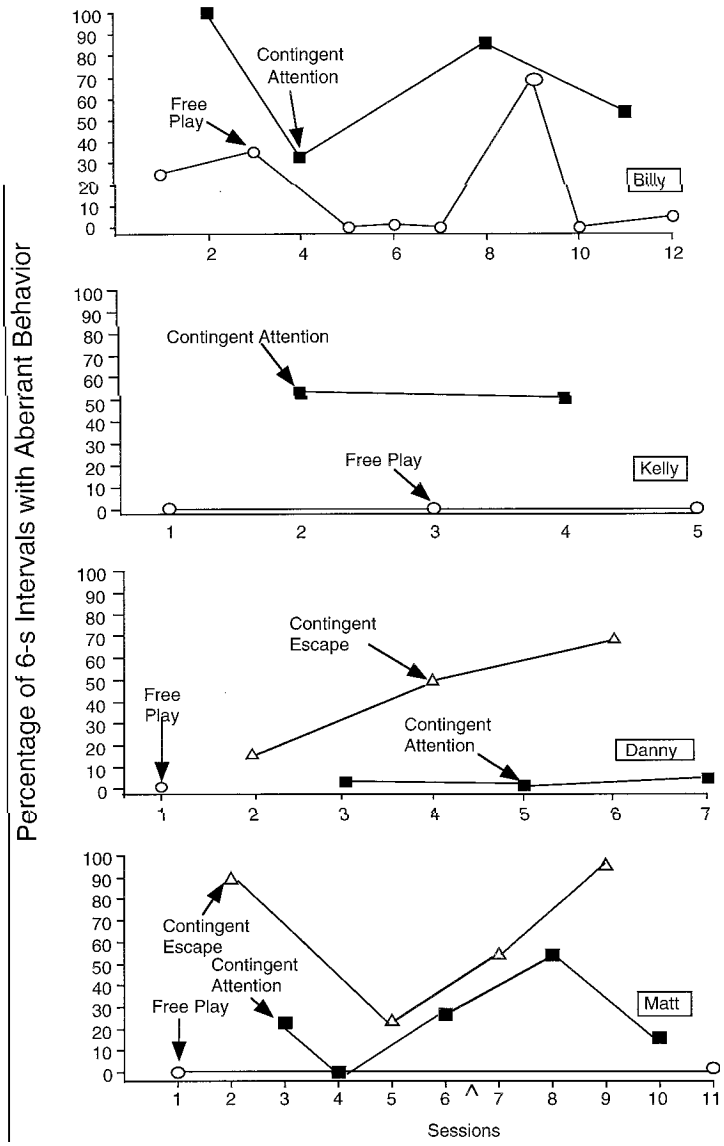

Figure 1. Initial functional analyses for Billy (top panel), Kelly (second panel), Danny (third panel), and Matt (bottom panel). ^ in Matt's figure indicates when the analysis began with his teacher in the classroom.

hypothesis. Contingency reversals were conducted at 6, 9, 12, and 17 months (see Appendix). During the analyses conducted at approximately 6 and 9 months, the target mand occurred most often within the contingent social attention conditions, supporting the results of the original functional analysis. During the analyses conducted at 12 months and 17 months, the target mand also occurred during contingent tangible conditions, suggesting a tangible reinforcement function. Thus, the contingency reversal analyses indicated that positive reinforcement was the maintaining class of reinforcement, but the reinforcer appeared to shift from attention only to attention plus tangible.

The results obtained for Billy during baseline, treatment, and follow-up are provided in Figure 2. Billy's baseline consisted of the

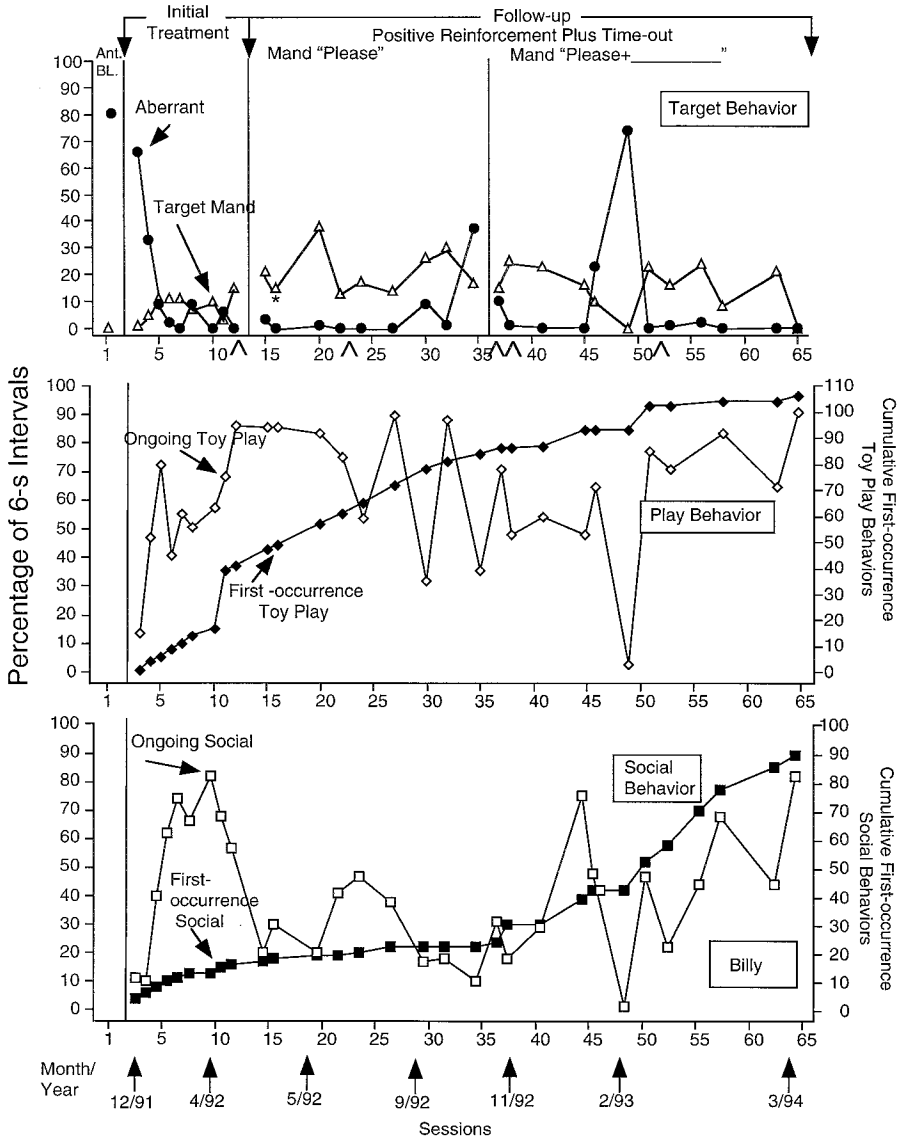

Figure 2. Billy's antecedent baseline (Ant BL), initial treatment, and follow-up results for aberrant and manding behaviors are presented in the top panel. In the middle and bottom panels, line graphs present ongoing behavior and are plotted via the scale on the left side of the figure. First-occurrence data are plotted using a cumulative line graph and are plotted via the scale on the right side of the figure. ∧ indicates that a contingency reversal analysis was completed. ∧∧ indicates that the treatment changed to include specific mands. * indicates the first treatment session in which target mands were 100% independent.

only session from the antecedent analysis that included both low levels of parent attention and low levels of task demands. Aberrant behavior occurred at a high level (80%), and target mands never occurred during baseline. Treatment initially consisted of contingent attention plus time-out and later consisted of attention and tangible items plus time-out; the target mand was the "please" sign. During the initial 6 months (Sessions 2 to 12), occurrences of aberrant behavior decreased to near 0% (M = 14%), with a simultaneous increase in the target mand (M = 8%). Billy engaged in 100%

independent target mands for the first time after approximately 7 months of treatment. Phase 3 (follow-up) was initiated after the treatment had been in place for 6 months. At approximately 10 months (Session 35), an increase in aberrant behavior occurred. At that time, a contingency reversal analysis was conducted, and a tangible function was identified. The treatment condition was then modified to require Billy to emit the original "please" mand and then ask (point, say, or sign) for a specific toy. This modification in treatment, with one exception (Session 48), resulted in reductions of aberrant behavior. At the completion of the investigation, aberrant behavior had remained at near-zero levels for over 1 year.

With few exceptions, Billy's ongoing toy play remained above 50% (M = 66%; range, 3% to 100%). The greatest increase in first-occurrence toy play occurred during the first 10 months of treatment (cumulative increase, 106). Conversely, ongoing social behaviors occurred at lower levels (M = 41%; range, 1% to 82%), with the greatest increases in positive first-occurrence social behaviors observed after 10 months (cumulative increase, 89). This increase in first-occurrence positive social behaviors occurred when Billy was taught to mand for specific toys; this corresponded with increased positive interactions with his mother. Throughout the 27 months of treatment and follow-up, only two first-occurrence negative social behaviors occurred (kicking and pulling on his mother's body).

The daily behavior log indicated that Kelly's aberrant behaviors (including self-injury and tantrums) occurred most often when her siblings returned home from school. The interview suggested that this time was associated with reduced levels of parent attention and that her mother typically responded by soothing Kelly via increased physical affection. During the antecedent analysis, the highest levels of all topographies of aberrant behavior were occasioned by low levels of parent attention, suggesting an attention function (see Appendix). This hypothesis was tested during the initial functional analysis (Figure 1) by comparing contingent attention and free-play conditions. Aberrant behavior occurred only during the contingent attention condition, supporting our attention hypothesis. Contingency reversals were conducted at 6 and 12 months, with both analyses indicating that social attention continued to be a reinforcer for manding.

The results for Kelly's baseline, treatment, and follow-up are provided in Figure 3. Kelly's baseline consisted of the six antecedent analysis sessions that were associated with low levels of parent interaction and low levels of task demands. Aberrant behavior was variable but occurred at a high level overall (M = 56%; range, 0% to 85%), and target mands never occurred during baseline. Treatment consisted of positive reinforcement plus time-out, and the target mand consisted of two-word commands (e.g., "turn page," "come here"). During follow-up, which was initiated after 2 months of treatment, Kelly was required to say the word "want" with the name of a specific desired outcome. This treatment change was made to match the speech intervention in place at school. Throughout the investigation, aberrant behavior occurred at 0% or near 0% (M = 0.65%; range, 0% to 9%), and manding behavior remained stable (M = 23%; range, 7% to 39%). Kelly engaged in 100% independent target mands for the first time during Session 37 (i.e., after approximately 7 months of mand training). During treatment and follow-up, ongoing toy play remained steady (M = 80%; range, 67% to 95%), and 24 first occurrences of toy play were recorded. Ongoing social behaviors steadily increased (M = 59%; range, 28% to 74%), with the greatest increase in positive first-occurrence social behaviors occurring during the last three sessions (cumula-

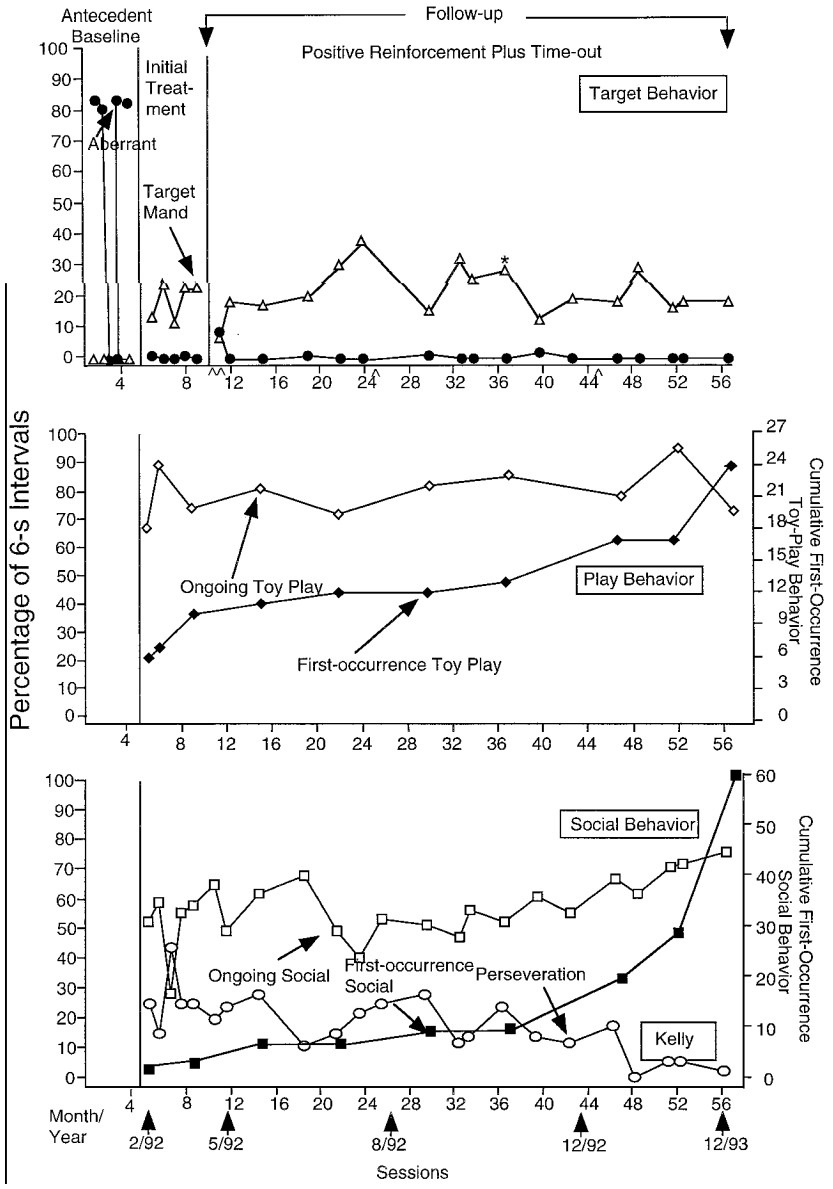

Figure 3. Kelly's antecedent baseline, initial treatment, and follow-up results for aberrant and manding behaviors are presented in the top panel. In the middle and bottom panels, line graphs present ongoing behavior and are plotted via the scale on the left side of the figure. First-occurrence data are plotted using a cumulative line graph and are plotted via the scale on the right side of the figure. ∧ indicates that a contingency reversal analysis was completed. ∧∧ indicates that the treatment changed to "want" plus item. * indicates the first treatment session in which target mands were 100% independent.

tive increase, 60). This increase in ongoing social behaviors correlated with a decrease in perseverative verbalizations (M = 17%; range, 0% to 42%). Throughout the 22 months of treatment and follow-up, no new first-occurrence negative social behaviors were recorded.

Danny's mother did not complete the daily behavior log. The interview suggested that his aberrant behaviors occurred throughout

the day. During the antecedent analysis, the highest levels of all topographies of aberrant behavior were occasioned by high levels of task demands, suggesting an escape function. This hypothesis was further tested during the initial functional analysis by comparing free-play, contingent attention, and contingent escape conditions (Figure 1). Aberrant behavior occurred almost exclusively during the escape condition, supporting the escape hypothesis. A contingency reversal was completed after 6 months of treatment. Manding was shown to be sensitive to both escape from demands and social attention as reinforcers, suggesting both negative and positive reinforcement functions. However, when different behaviors are targeted for reinforcement across analyses (i.e., aberrant behavior vs. mands), inferences regarding a change in function should be made with caution.

The results obtained for Danny during baseline, treatment, and follow-up are provided in Figure 4. Danny's baseline sessions consisted of the eight antecedent analysis sessions that were associated with high levels of parent attention and task demands. Aberrant behavior was variable but occurred at a moderate level overall (M = 46%; range, 0% to 98%), and target mands never occurred during baseline. Treatment consisted of negative reinforcement with positive reinforcement plus guided compliance. Danny received a brief escape from the work tasks contingent on the target mand. A decreased level of aberrant behavior occurred throughout the investigation (M = 10%), but manding behavior also remained low (M = 7%). Danny engaged in 100% independent target mands for the first time during Session 19 (i.e., after approximately 2 months of treatment). Throughout treatment, ongoing toy play responses occurred at low levels (M = 35%), but a total of 45 first-occurrence toy play behaviors occurred. Ongoing social responses occurred at moderate levels (M = 44%; range, 24% to 66%), with a cumulative increase in first-occurrence positive collateral social responses of 15. Throughout the investigation, only one first-occurrence negative social behavior occurred.

The daily behavior log suggested that Matt's aberrant behaviors occurred most often during mealtimes and when he was asked to participate in the family's morning routine. The interview revealed that these times were associated with increased demands (i.e., being asked to pick up toys or put his clothes on), and his aberrant behaviors resulted in exclusionary time-out (i.e., being placed in his bedroom). During the antecedent analysis, the highest level of aberrant behaviors were occasioned by increased task demands (picking up toys), suggesting an escape function. This hypothesis was further evaluated during the initial functional analysis by comparing free-play, contingent attention, and contingent escape conditions. The initial functional analysis (Figure 1) was conducted in both the home and the preschool settings. At both home and school, increased levels of aberrant behavior were observed in the escape and attention conditions, supporting the escape hypothesis and providing evidence for an additional attention function. A contingency reversal was conducted after approximately 7 months of treatment. In that analysis, manding was shown to be sensitive to both escape from demands and social attention.

The results obtained for Matt during baseline, treatment, and follow-up for aberrant behavior maintained by negative reinforcement are provided in Figure 5. Matt's baseline sessions consisted of the four antecedent analysis sessions that were associated with high levels of parent attention and task demands. Aberrant behavior occurred at a high level (M = 74%; range, 45% to 94%), and target mands never occurred during baseline. Treatment consisted of negative re-

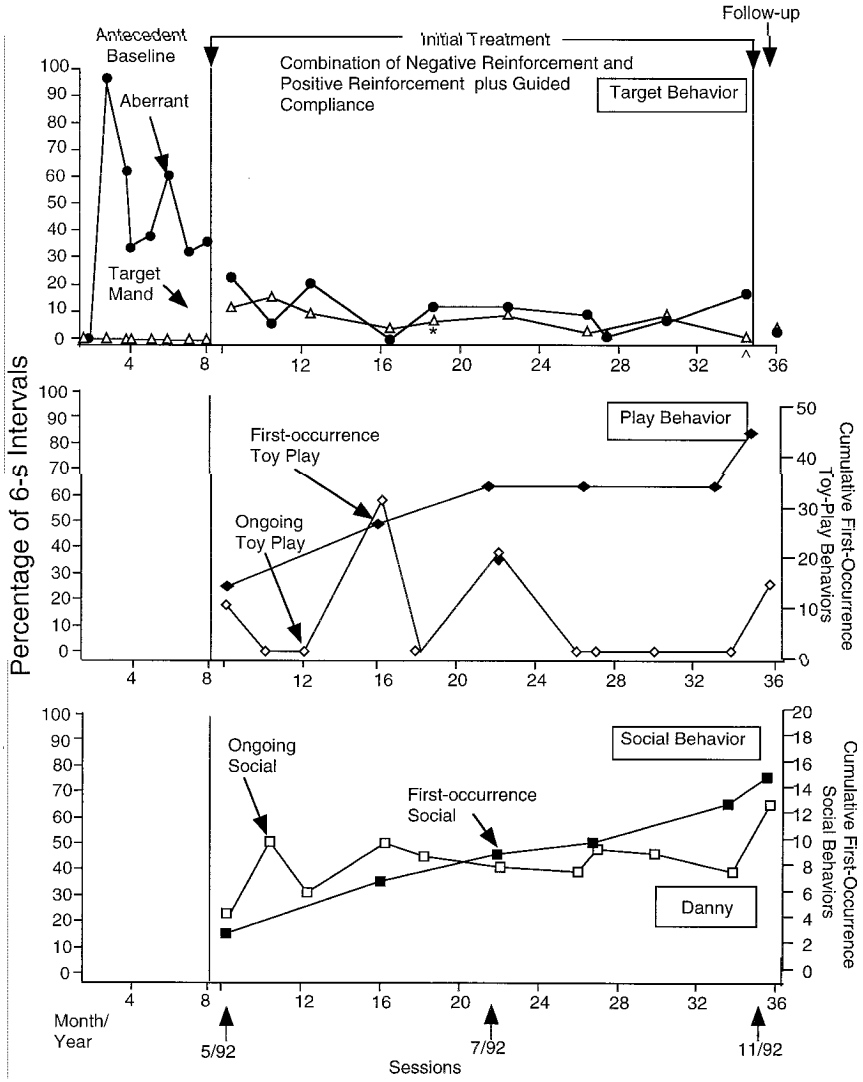

Figure 4. Danny's antecedent baseline, initial treatment, and follow-up results for aberrant and manding behaviors are presented in the top panel. In the middle and bottom panels, line graphs present ongoing behavior and are plotted via the scale on the left side of the figure. First-occurrence data are plotted using a cumulative line graph and are plotted via the scale on the right side of the figure. ^ indicates that a contingency reversal analysis was completed. * indicates the first treatment session in which target mands were 100% independent.

inforcement with positive reinforcement plus guided compliance. Matt received a brief escape from work tasks contingent on the target mand. Aberrant behavior occurred throughout the investigation (M = 25%; range, 4% to 91%), even though manding remained stable (M = 10%; range, 8% to 19%). Matt engaged in 100% independent target mands for the first time during Session 17 (i.e., after approximately 7 months of treatment).

An increased level of aberrant behavior occurred during sessions that were conducted at the family's summer cabin. A review of the videotape suggested that this increase in aberrant behavior was probably the result of poor treatment integrity; integrity for mands was 54% and punishment integrity was

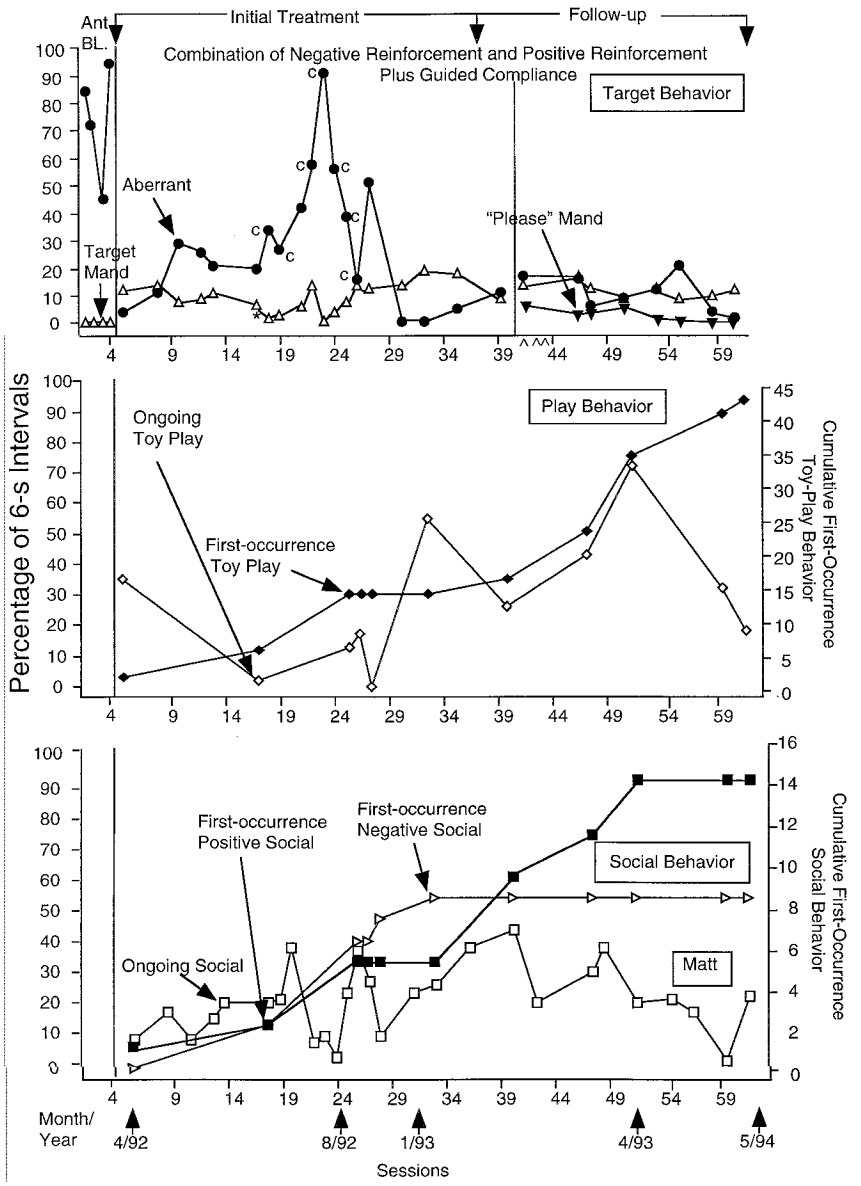

Figure 5. Matt's antecedent baseline (Ant BL), initial treatment, and follow-up results for aberrant and manding behaviors are presented in the top panel. In the middle and bottom panels, line graphs present ongoing behavior and are plotted via the scale on the left side of the figure. First-occurrence data are plotted using a cumulative line graph and are plotted via the scale on the right side of the figure. C indicates that the session was conducted in the family cabin. ∧ indicates that a contingency reversal analysis was completed. ∧∧ indicates that the treatment changed to include the mand "please." * indicates the first treatment session in which target mands were 100% independent.

31%. Conversely, integrity for mands at home was 85% and punishment integrity was 58%.

Throughout treatment, ongoing toy play occurred at variable levels (M = 33%; range, 0% to 72%), and a total of 42 first-occurrence toy play behaviors were observed. Ongoing social responses occurred at low levels (M = 21%; range, 0% to 44%), with a cumulative increase in positive social responses

of 14. Throughout treatment, seven first-occurrence negative social behaviors were displayed, all of which occurred in the first 7 months.

Because the initial functional analysis and the contingency reversal suggested both negative and positive reinforcement functions for Matt, we probed a diverted-attention condition concurrent with the FCT training condition to further evaluate the effects of social attention on aberrant behavior. These probes were initiated after 6 weeks of mand training; thus, the first probe was conducted during Session 12. As shown in the top panel of Figure 6, aberrant and manding ("done") behavior rarely occurred during the first 4 months (*M*s = 0% and 1%, respectively). However, between Months 4 and 7 (Sessions 26 through 33), both aberrant behavior and signing "done" occurred at increased levels (*M*s = 8% and 7.5%, respectively). Because Matt received both attention and escape for signing "done," we hypothesized that this response had generalized to low social situations and was maintained by positive reinforcement. To test this hypothesis, we conducted a contingency reversal analysis, and an attention function was identified. Treatment in this condition was initiated to require Matt to sign or say "please" to gain social attention and tangible items. The addition of the "please" mand resulted in a decrease in aberrant behavior (range, 0% to 7%) and the "done" sign (range, 0% to 8%) to a level near 0% throughout the remaining 18 months of the investigation. The "please" mand occurred at a consistent level (range, 0% to 19%). Matt engaged in 100% independent "please" mands for the first time during Session 45 (i.e., after approximately 2 months of treatment using the "please" sign). After Matt was trained to emit the "please" mand, the results for toy play and social behaviors were similar to those of the treatment condition; ongoing toy play was variable (*M* = 32%; range, 11% to 67%), and ongoing social behaviors occurred at low levels (*M* = 24%; range, 8% to 48%). Cumulative first-occurrence toy play and positive social responses were 21 and 9, respectively. Of note is that a majority of the first-occurrence social and toy play behaviors occurred following the initiation of the "please" mand. Throughout the 24 months of treatment, no first-occurrence negative social behaviors occurred in the diverted-attention condition.

DISCUSSION

Clinically, this investigation showed that long-term suppression of aberrant behavior is possible when functional analysis and FCT treatment packages are implemented in home settings by parents. In all cases, effective suppression of aberrant behavior was achieved and positive social behavior emerged. These results replicate previous studies on maintenance of FCT (Durand & Carr, 1992; Northup et al., 1994) and previous studies on the application of these procedures in home (Arndorfer et al., 1994) and school (Cooper et al., 1992; Durand & Carr, 1991, 1992; Northup et al., 1994; Sasso et al., 1992) settings. In this study, parents conducted all procedures effectively with only intermittent consultation. Anecdotally, the parents reported that the procedures were effective throughout the day. In addition, results obtained during observations that were conducted outside of treatment indicated that no adverse effects occurred in situations typically encountered in the home (e.g., free play and when the parent's attention was diverted). No negative side effects (e.g., family disruption) were reported, and the treatment was effectively transferred to a school setting for 3 children (Billy, Kelly, and Matt). In addition, Billy's parents were attempting to place him in a regular education classroom. These anecdotal reports, coupled with the results of the

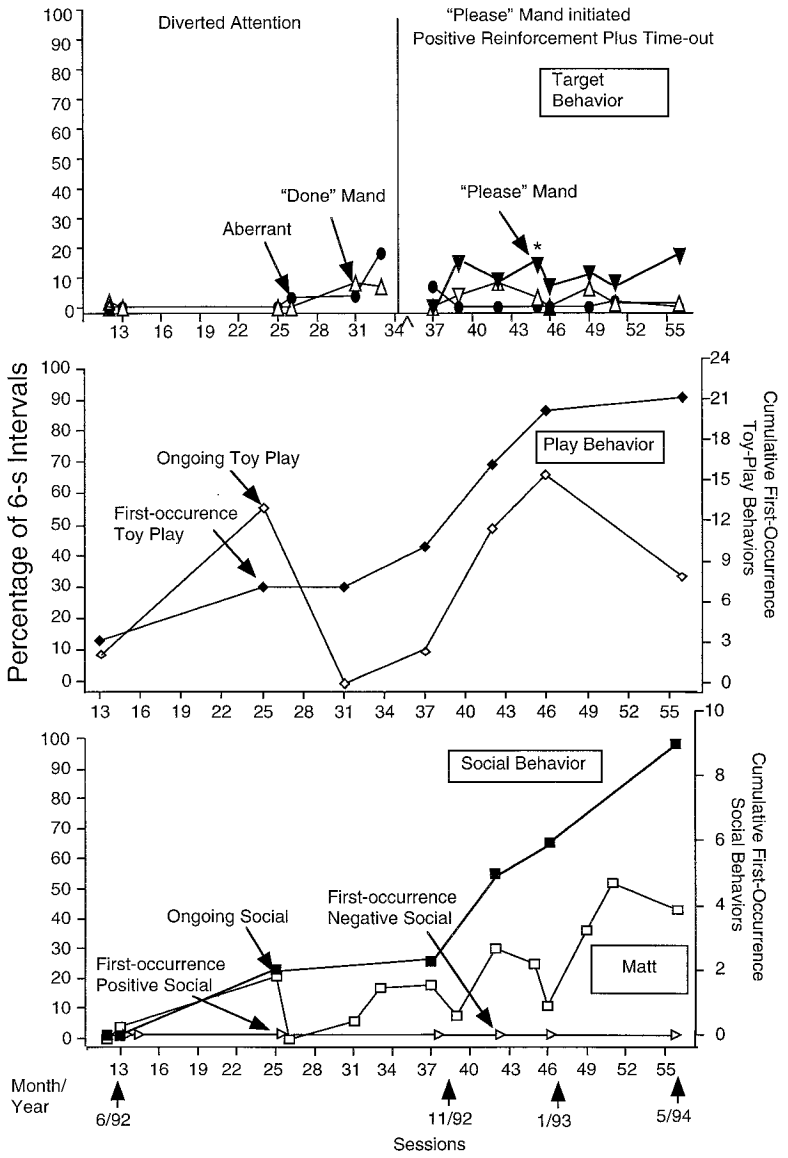

Figure 6. Matt's diverted-attention generalization condition results for aberrant and manding behaviors are presented in the top panel. In the middle and bottom panels, line graphs present ongoing behavior and are plotted via the scale on the left side of the figure. First-occurrence data are plotted using a cumulative line graph and are plotted via the scale on the right side of the figure. * indicates the first treatment session in which target mands were 100% independent.

investigation, provide evidence of the social validity of this treatment model.

We approached the use of functional analysis procedures in home settings very cautiously. Our concern was that the analogue formats developed by Iwata et al. (1982/1994) might overwhelm parents when conducted in their homes. Given these concerns, a three-phase assessment model was developed that used descriptive, antecedent, and functional analyses. The descriptive assessment provided us with information regarding situations and times that were typically associated with the aberrant behavior.

The primary contribution of the antecedent analysis was that it allowed us to identify tasks and activities for use in subsequent assessment and treatment conditions. The functional analysis provided us with a definitive methodology for identifying the function of aberrant behavior. Although the information obtained from the descriptive and antecedent analyses was useful, the functional analysis was the most efficient. However, as discussed by Mace and Lalli (1991), a combination of descriptive and functional analyses is useful, with the descriptive analysis being used to select specific tasks and activities and the functional analysis being used to empirically validate functions.

Conceptually, this investigation suggests that long-term suppression of aberrant behavior may involve both functional equivalence (Carr, 1988) and collateral responding. For all children, the initial suppression of aberrant behavior appeared to be best accounted for by functional equivalence. In most cases, stable decreased levels of aberrant behavior and increased manding occurred before collateral changes in positive social responding were observed. Matt's results provide an example of the role of functional equivalence in initial treatment. During the first 6 months of treatment, treatment integrity was inconsistent, Matt's aberrant behavior remained high, and the occurrences of the target mand failed to be stable. This was shown especially by the increased aberrant behavior that occurred at the family cabin. After the first 6 months of treatment, treatment integrity improved, manding occurred at an increased and more stable level, and aberrant behavior decreased and remained low throughout the remainder of the investigation. These results, coupled with those of previous investigations, support the supposition that mand training can effectively suppress aberrant behavior when reinforcement is provided for manding and aberrant behavior is placed on extinction or results in punishment (Fisher et al., 1993; Wacker et al., 1990). Previous studies (Fisher et al.; Wacker et al.) have supported the use of extinction and punishment contingencies in FCT. In the current investigation, every treatment package contained these components, but it is unclear whether treatment would have been effective without these components. It seems likely, however, that the inclusion of these components facilitated the initial suppression of aberrant behavior, given the relatively quick effectiveness of treatment.

The results also suggest that successful long-term maintenance may involve more than one-to-one replacement of aberrant behavior with mands. As conducted here, FCT was associated with changes in parent–child interactions. As children manded and parents reinforced those mands, substantial changes in other positive social behavior also occurred. During treatment probes, parents reinforced positive social behavior 85% of the time in addition to reinforcing mands. We interpret this finding as being consistent with Koegel and Koegel's (1988) definition of pivotal responding. In this view, manding functioned as a pivotal response that was correlated with multiple topographies of positive social behavior. These social behaviors were, in turn, maintained by the same reinforcement contingencies that initially increased mands.

The results for Billy are the best example of how mands may serve as pivotal responses during FCT treatment. During the first months of treatment, Billy's mother trained him to emit a mand to gain social attention and toys. As the mand was established in Billy's repertoire, an increase in first-occurrence toy play occurred. When Billy was then trained to emit additional mands for specific toys, the greatest increase in first-occurrence social behavior occurred, with a concomitant decrease in aberrant behavior. It is, however, unclear whether

manding is a unique pivotal response. Perhaps other behavioral responses, such as compliance, would function in a similar manner.

These results suggest that long-term suppression of aberrant behavior with FCT treatment may occur in two stages: (a) a one-to-one replacement of aberrant behavior with mands, and (b) ongoing suppression of aberrant behavior via multiple positive social responses that each receive reinforcement. According to this supposition, long-term maintenance occurs because of the increased availability of multiple responses that are reinforced. This increased number of reinforced social responses, in turn, reduces the probability of the child's choosing to engage in aberrant behavior. In subsequent studies, this situation might be evaluated directly via a choice analysis, as suggested by Mace and Roberts (1993). If aberrant and positive social behaviors are considered to be concurrent choices, it seems reasonable to predict greater allocation to social responses as a function of both the reinforcement available for these responses and a greater number of those responses resulting in reinforcement.

The overall long-term results were impressive but appeared to be different depending on the initial function of aberrant behavior. For Billy and Kelly, whose treatments were based on a positive reinforcement function, near-zero levels of aberrant behavior were observed within the first 10 treatment sessions, and substantial response generalization (as measured via collateral responses) occurred. Conversely, when initial treatments were based on a negative reinforcement function (i.e., Matt and Danny), aberrant behavior occurred throughout treatment, and less response generalization occurred.

The functional relationships that were responsible for the long-term results obtained for Danny and Matt are unclear. In most previous investigations that have evaluated long-term maintenance (Durand & Carr, 1991; Northup et al., 1994), the negative reinforcement for manding was removal of demands. In the present investigation, the consequence for manding was both the removal of demands and the presentation of attention and toys. Thus, the long-term results obtained for Danny and Matt might have been a function of both positive and negative reinforcement contingencies. This possibility is suggested by the first-occurrence toy play and social behavior for Matt. Both behaviors increased substantially after he was trained to emit a mand to gain attention. To better evaluate this possibility, future studies could compare the long-term effects of negative reinforcement–based treatments with and without a positive reinforcement component delivered during breaks.

A number of limitations to the current study should be noted. First, only intermittent probes were conducted. Although these probes provided information regarding long-term trends in behavior, it is possible that more subtle changes in responding may have been missed. Second, we had no reliable assessment of how the parents implemented the treatment procedures outside the videotaped sessions, and treatment integrity was variable. Third, an experimental analysis of the treatment package (e.g., a component analysis) was not completed. Thus, the distinct roles of punishment and reinforcement were not isolated. Fourth, we do not know whether the first-occurrence behaviors would have emerged as part of normal development. The specific effects of treatment on the first-occurrence behaviors can only be inferred from the correlational results. All parents had been told by educational and health care professionals that their child's future abilities would be minimal at best. For example, Billy's mother had been informed by the family physician

that he would never be able to walk or speak, both of which he did frequently at the end of treatment. These anecdotal results support the conclusion that treatment facilitated social responding, but the results are correlational. Finally, an extensive evaluation of different types of pivotal responses was not completed. We chose to study mands because previous investigators had found reinforcement of mand responses to be correlated with an increase in other positive social behaviors (Koegel & Frea, 1993; Sprague & Horner, 1992). However, research is needed regarding the generalized effects of reinforcing other behaviors such as task completion or appropriate social responses within a child's pretreatment repertoire.

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Received May 6, 1996
Initial editorial decision July 7, 1996
Final acceptance April 30, 1997
Action Editor, Robert H. Horner

APPENDIX

Summary of Pretreatment and Posttreatment Assessment Results for All Children

Billy

The descriptive assessment (i.e., behavior log and parent interview) indicated that aberrant behavior occurred when Billy woke up in the morning and when his siblings returned home from school. Results of the antecedent analysis indicated that aberrant behavior was occasioned by decreased parental attention, and an attention function was hypothesized. During the initial functional analysis, contingent attention was found to increase aberrant behavior, supporting our attention hypothesis. Contingency reversal analyses were conducted following 6, 9, 12, and 17 months of treatment and follow-up. During the analyses conducted at 6 and 9 months, contingent attention was found to increase manding, suggesting a social attention function. During the analyses conducted at 12 and 17 months, contingent tangible items were found to increase manding, suggesting an additional tangible function.

Kelly

The descriptive assessment (i.e., behavior log and parent interview) indicated that aberrant behavior occurred when her siblings returned home from school. Results of the antecedent analysis indicated that aberrant behavior was occasioned by decreased parental attention, and an attention function was hypothesized. During the initial functional analysis, contingent attention was found to increase aberrant behavior, supporting our attention hypothesis. Contingency reversal analyses were conducted following 6 and 12 months of treatment and follow-up. During these analyses, contingent attention was found to increase manding, suggesting an attention function.

Danny

The descriptive assessment (i.e., parent interview only) indicated that aberrant behavior occurred throughout the day. Results of the antecedent analysis indicated that aberrant behavior was occasioned by increased task demands, and an escape function was hypothesized. During the initial functional analysis, contingent escape was found to increase aberrant behavior, supporting our escape hypothesis. A contingency reversal analysis was conducted following 6 months of treatment. During this analysis, contingent attention and escape were found to increase manding, suggesting both attention and escape functions.

Matt

The descriptive assessment (i.e., behavior log and parent interview) indicated that aberrant behavior occurred at mealtimes and during morning routines. Results of the antecedent analysis indicated that aberrant behavior was occasioned by increased task demands, and an escape function was hypothesized. During the initial functional analysis, contingent escape was found to increase aberrant behavior, supporting our escape hypothesis. A contingency reversal analysis was conducted following 7 months of treatment. During this analysis, contingent attention and escape were found to increase manding, suggesting both attention and escape functions.

STUDY QUESTIONS

1. The authors suggested that functional equivalence and collateral responding are two operant mechanisms that underlie the long-term effectiveness of functional communication training (FCT), but neither is a basic principle of learning. What basic principles probably account for decreases in aberrant behavior and increases in more socially acceptable behavior that are often observed during FCT?

2. What were the three purposes of the study?

3. In addition to measuring target behaviors, mands, and appropriate behaviors exhibited by the participants, the authors collected data on collateral responses. What types of responses were considered collateral, and why did the authors make a distinction between initial and subsequent occurrences of such responses?

4. Describe the general procedure used for assessing interobserver agreement. In what way was the procedure different than that typically used in most research?

5. What were the key differences between the antecedent and functional analysis procedures used during assessment?

6. Describe the outcomes of the functional analysis for each of the participants.

7. Describe the two FCT conditions and briefly summarize the results obtained for the 4 children.

8. The authors also included data on the parents' consistency in implementing treatment. What is one possible explanation for the observed discrepancy between accuracy in delivering reinforcement and delivering punishment?

Questions prepared by SungWoo Kahng and Michele Wallace, The University of Florida